DISTINCTION BETWEEN P-TYPE & N-TYPE SC'S

Feature	N-Type Semiconductor	P-Type Semiconductor
Doping Impurity Type	Doped with **pentavalent impurities** (Group 15 elements). These elements have 5 valence electrons.	Doped with **trivalent impurities** (Group 13 elements). These elements have 3 valence electrons.
Examples of Impurities	Phosphorus (P), Arsenic (As), Antimony (Sb), Bismuth (Bi).	Boron (B), Aluminum (Al), Indium (In), Gallium (Ga).
Electron Contribution/Acceptance	The impurity atom **donates** one excess electron to the crystal lattice.	The impurity atom **accepts** an electron from a neighboring silicon/germanium atom, creating a "hole".
Name of Impurities	Called **Donor Impurities** because they donate free electrons.	Called **Acceptor Impurities** because they accept electrons (creating holes).
Majority Charge Carriers	**Electrons** are the majority charge carriers. Due to the donated electrons, the concentration of free electrons is much higher than holes.	**Holes** are the majority charge carriers. Due to the accepted electrons (creating holes), the concentration of holes is much higher than free electrons.
Minority Charge Carriers	**Holes** are the minority charge carriers. They are generated due to thermal excitation.	**Electrons** are the minority charge carriers. They are generated due to thermal excitation.
Overall Charge	Electrically **neutral**. The atoms themselves are neutral; the doping just adds mobile charge carriers.	Electrically **neutral**. The atoms themselves are neutral; the doping just adds mobile charge carriers.

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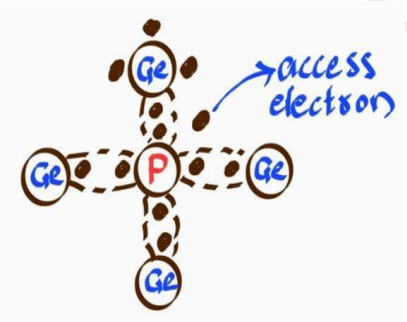
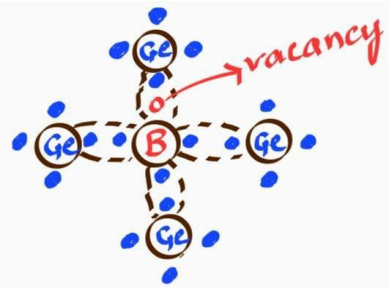
Fermi Level Position	The Fermi energy level (E_F) shifts **closer to the Conduction Band (CB)**, lying between the conduction band and the donor energy level.	The Fermi energy level (E_F) shifts **closer to the Valence Band (VB)**, lying between the valence band and the acceptor energy level.
Energy Band Diagram	A **donor energy level** (E_D) is created just below the conduction band, representing the energy level of the donated electrons.	An **acceptor energy level** (E_A) is created just above the valence band, representing the energy level where electrons can be accepted from the valence band.
Notation	Often denoted as **n-type**, for negative charge carriers (electrons).	Often denoted as **p-type**, for positive charge carriers (holes).
Current Conduction	Primarily due to the movement of free electrons.	Primarily due to the movement of holes.
Diagram		

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